longer the two corresponding residuals might have been slightly larger.

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The New York Meeting of Section C of the American Association for the Advancement of Science and the Thirty-fifth General Meeting of the American Chemical Society—II.

Biological Chemistry

Wm. J. Gies, Chairman

The Rational Conversion of Energy: J. E. Siebel, Jr.

The Thermodynamics of Nutrition: J. E. Siebel, Jr.

The Effects of Magnesium Sulphate upon Seedlings: Gertrude Burlingham.

From extended experiments upon the growth of seedlings in dilute solutions of magnesium sulphate, it was found that while it is usually toxic in strengths greater than *M*/8192 (0.003 per cent.), it produces decided stimulation in *M*/16384, reaches a maximum stimulation at dilutions from *M*/32768 to *M*/131072 (0.00075 per cent. to 0.00018 per cent.), then beyond this point gradually diminishes in action. The point of toxicity and of greatest stimulation varies with the type of seedling. Both the plumule and the roots attain greater growth in these favorable dilutions of magnesium sulphate and in the control of distilled water, and often the lateral roots develop two or three days sooner. While growth in the control practically stops at the end of one week, it continues from four to five weeks in the magnesium sulphate cultures. Two parallel series, one magnesium sulphate and control, the other calcium nitrate and control, in dilutions from *M*/8192, *M*/16384, etc., to *M*/262144, showed that calcium ceases to be stimulating in the dilution in which magnesium loses its toxicity and produces maximum stimulation; in *M*/32768 magnesium sulphate the root growth is eight times that in calcium nitrate. In every instance after the renewal of the solutions, growth was accelerated in the magnesium cultures, while there was little change in the control. Seedlings allowed to grow for several weeks in a dilution of magnesium sulphate which was at first slightly toxic, finally developed strong lateral roots and attained a root growth far beyond the control. These results show conclusively that magnesium sulphate in proper dilution is beneficial to the growth of seedlings, and that any inhibitory effects are due to the presence of excessive amounts, thus controverting Loew's theory that magnesium salts when alone in solution are always injurious to plant growth.

Chronic Arsenical Poisoning and the Distribution of Arsenic in the Animal Organism: Wm. D. Harkins.

In copper smelting regions arsenic is likely to be a constituent of grass, hay, and all the organs of animals. Grass has been found to contain as high as 1,500 parts of arsenic trioxide, and the ulcers in the noses of horses as high as 1,000 parts per million. 0.362 Gram of arsenic trioxide killed a sheep in eight days, 0.123 gram of sodium arsenite killed a sheep in thirty-three days with thirty-one pounds loss of weight, and 0.055 gram in sixty-nine days with ten pounds loss in weight.

On Proteose Fever: R. B. Gibson.

Fever has been considered to result from the injection of prepared proteoses and of bacterial endo- and extra-cellular proteose-like substances, especially as albumosuria is often observed in septic and aseptic fevers of experimental or natural origin. As yet no observations have been made with proteoses prepared from highly purified or crystalline proteids. Pepsin-HCl

proteoses were prepared as usual, but without subjecting the products to temperatures over 50° C., from repeatedly precipitated caseinogen, recrystallized egg albumin and recrystallized edestin. Proteoses soluble and insoluble in 95 per cent. alcohol were obtained from each. Bromelin and papain caseoses were also employed. The proteoses were injected in doses of 0.3 to 0.7 gm. into guinea-pigs and 0.5 to 1.2 gm. into rabbits; the temperature variations were observed on several days previous to the injection and were controlled by saline injections. The bromelin and papain caseoses and egg albumin proteoses have at times caused slight rise of temperature, while the purest material—the edestinose—has been practically without effects whenever tried. Extraction of the bromelin and papain caseoses with boiling alcohol has lessened the pyrexia, and the products soluble in 95 per cent. alcohol were found non-febrile. The primary cleavage products of pepsin-HCl digestion, when prepared as above, never have more than a slight pyrogenic effect when injected into rabbits and guinea pigs. This effect is so slight that such substances can not be the direct inciting cause of the severe naturally occurring fevers.

The Fractional Precipitation of Antitoxic Serum: E. J. BANZHAF and R. B. GIBSON.

A new practical method for the partial purification and concentration of antitoxin, based on the solubility of antitoxic proteids in saturated NaCl solution. The diluted plasma is precipitated with an equal volume of saturated $(NH_4)_2SO_4$ solution and the antitoxic proteids extracted from the precipitate with saturated NaCl. The method has been used to study further the concentration of antitoxin. Twenty liters of plasma (475 units per c.c.) were diluted with 20 liters of water; by fractioning with $(NH_4)_2SO_4$, the three proteid precipitates were obtained containing 1,150, 1,350 and 1,750 units, respectively, per c.c. The NaCl-soluble (total antitoxic) globulins of these fractions of the plasma were prepared as usual.

A second experiment resulted similarly. All the preparations, when precipitated from the NaCl with acetic acid and dialyzed, probably contained a partially denaturalized antitoxic globulin, which had a diminished solubility and antitoxic potency (per gm.) and was precipitated on slight acidification by great dilution. Further partition (after complete neutralization) of the fractions when freed from the water-acid precipitable proteid yielded filtrates that coagulated at 73° C. The more soluble proteids of the fractions were found to have a relatively higher antitoxic content per gm., the last to be precipitated being at least three to four times stronger than the total NaCl-soluble globulin.

Some Factors Modifying the Output of Endogenous Uric Acid: E. W. ROCKWOOD and C. VAN EPPS.

An attempt was made to determine the effect of some substances commonly used to increase the elimination of uric acid by man; at the same time the nitrogen, phosphoric acid and, in some cases, the creatinine, were determined. The diet was constant and either purine-free or contained a fixed amount of purine derivatives. After it was proved that chocolate did not cause an increase of the uric acid this was included, in one case, in the food. Alkalies and some of their salts whose decomposition products make the urine alkaline were tried. Of these sodium bicarbonate caused no increase; lithium carbonate, a decrease; potassium acetate and sodium citrate, no change. Colchicum slightly decreased the uric acid. With both sodium salicylate and aspirin (the acetic acid ester of sali-

cylic acid) the uric acid of the urine was increased. One subject with chronic albuminuria, but otherwise no marked renal lesions, eliminated no more than the normal amount when aspirin was taken. Creatinine with all these drugs showed a remarkable constancy.

The Properties of Culture Media as affected by Certain Products of Plant Metabolism: Oswald Schreiner and J. F. Breazeale.

It was shown that certain products of plant metabolism, degradation products of proteids and lecithins, were harmful to seedling plants. Some of these products found in green plants lose their toxic properties on oxidation and become beneficial. It was pointed out that this explained the advantages of green manuring over mineral fertilizers and the chemistry of green manuring was discussed in this connection.

On the Increase in Weight in the Hydrolysis of Casein: J. H. Long.

By the digestion of casein and other proteins by action of pepsin and hydrochloric acid an increase in weight follows from the absorption of water and the addition of molecules of the acid to form salt-like bodies with the products of hydrolysis. In this paper the author describes a series of experiments in which casein was treated through a period of about five weeks with pepsin and dilute hydrochloric acid at a temperature of 40°. The digestion mixture was distributed through a series of flasks and from time to time one of these was removed from the thermostat and used for tests. The residue on evaporation was determined and in this the combined hydrochloric acid. The titration values by aid of dimethylaminoazobenzene, phenolphthalein and *p*-nitrophenol were also found. By combination of all these data from the whole series of mixtures an attempt was made to show in tabular form the rate of addition of water and acid throughout the digestive period.

The author called attention also to the value of *p*-nitrophenol as an indicator in the titration of digestion mixtures, an application which seems to have been quite overlooked.

Further Experiments on the Composition of Feces Fat: J. H. Long.

In previous papers by the author attention has been called to the large phosphorus content of the purified fat from the feces of individuals in normal health. This paper presents the results of a lengthy series of experiments in which the characteristics of feces fat are more fully worked out, and especially of the portion which may be described as a body, or mixture of bodies, of the lecithin type. It was found that a large fraction of the fat could be precipitated from alcohol solution by cadmium chloride and from ether solution by acetone. Nitrogen and phosphorus were determined in the fractions precipitated by acetone, and in the fraction not so precipitated. It was found that practically all the phosphorus was contained in the acetone precipitate, while the nitrogen was present in both. A part or all of the nitrogen may have been split off from the original complex, however. The ratio of phosphorus to nitrogen was determined in the original fat, and in the several fractions; also the iodine members, the saponification equivalents and other constants.

The Influence of Alcohol on the Excretion of Inorganic Constituents of the Urine: F. C. Hinkel and Wm. Salant.

Fifty cubic centimeters of 50 per cent. or 70 per cent. alcohol given by mouth to a healthy dog caused a diminution of chlorides—about 22 per cent. The phosphates were diminished about 40 per cent.

Total sulphates were decreased during the alcohol period about 36 per cent. After alcohol was discontinued the urinary chlorides returned to the normal. The phosphates likewise increased in amount, but at the end of ten days the daily total was about 15 per cent. below the daily average for the control period.

A Study of the Effects of Cerium Salts and of Salts of Some Related Metals: GEORGE BAEHR and HARRY WESSLER.

Cerium oxalate was administered to dogs in relatively large doses for days, occasionally as much as 50 grams at a dose, without eliciting any symptoms beyond a slight increase in the amount of feces evacuated daily, a symptom following the administration of any inert powder in large quantities. The oxalates of neodymium, praseodymium, lanthanum and thorium, all of which are associated as impurities in commercial cerium oxalate, were also absolutely non-toxic. As to the efficiency of cerium oxalate in alleviating vomiting, when induced artificially by drugs acting either locally on the gastric mucosa or centrally on the medulla, our results up to date are not conclusive enough to permit us to decide, but apparently, except in large doses, it has little or no influence on vomiting. The action of cerium oxalate seems to be simply mechanical and local on the gastric membrane. Cerium nitrate, as a soluble salt, combines readily with protein and when injected hypodermically in dogs, a large ulcer was always formed around the site of injection. Besides this, a few days after the injection intense gastro-intestinal disturbances occurred, such as vomiting and diarrhea which was sometimes very bloody. The autopsies showed an unusual violence of the gastric and intestinal peristalsis and an empty gut, the mucous membrane of which was markedly congested and in places ecchymotic. The assumption is justifiable that at least a large part of the cerium in such cases must be eliminated from the body through the alimentary tract.

The Solubility of Acetanilide, Phenacetine, Caffeine and Salol in Several Organic Solvents: ATHERTON SEIDELL.

The author has determined the solubility at room temperature of these common constituents of headache powders in acetone, benzene, benzaldehyde, amyl alcohol, amyl acetate, aniline, acetic acid, xylene and toluene. Salol may be removed almost completely from a mixture of all four of the substances by either toluene, xylene or benzene, and acetanilide and phenacetine can be removed fairly satisfactorily from their mixtures with caffeine by means of amyl alcohol or acetate.

The Effect of Caffeine on the Contractions of the Different Parts of the Ureter: D. R. LUCAS.

Medium-sized dogs were narcotized by subcutaneous injections of 0.006 gm. of morphine and 0.001 gm. of atropine per kilo of body weight. Venous perfusion of one per cent. caffeine sulphate in Ringer's solution caused the pressure in the renal pelvis to rise steadily; the tracing was surmounted by small curves, the rise in pressure continued for thirty to ninety seconds, the pressure in the straight portion remained unaltered, until at the end of the time indicated a sudden reversal of pressure took place, several smaller variations from normal pressure followed in both parts of the ureter, and the relative pressure in the different parts was finally reestablished. However, the frequency of contractions in each portion continued at an increased rate. The stimulating effect of caffeine on the ureter was studied in a series of experiments which were planned entirely to eliminate the factor of renal secre-

tion. The kidney, ureter and adjacent portion of the bladder were excised, *in situ*, and placed in a bath of warm Ringer's solution. The caffeine was used by suffusion or perfusion. The stimulating effect was observed by the graphic method. When solutions containing 2–5 per cent. of caffeine were used, tonic contractions took place that lasted one to three minutes, after which the peristaltic waves were much smaller and more frequent. In both series of experiments the stimulating action of caffeine caused the pelvis to contract in a tonic manner, the isthmus apparently exerting a sphincteric action, which prevented the urine from passing until the constriction was overcome by the increasing pelvic pressure, at which time equilibrium in the tone of the different parts was reestablished.

The Occurrence of Manganese in the Fresh-water Clam: Harold C. Bradley.

Manganese has been found in considerable amounts in the tissue ash of specimens of the common fresh-water clams of the Mississippi Basin—*Unio* and *Anadonta*—obtained from the lakes at Madison, Wisconsin. It was suspected in the first instances that the manganese might be present in the intestinal tract, from manganese bacteria ingested with the food; but after six weeks starvation the apparent amount of the metal in the ash was unchanged. It seems probable, therefore, that manganese is normally present in these molluscs. Further examination shows it to be regularly present in the blood and eggs, while iron is present in small amounts and copper only in minute traces. The presumption seems warranted that the respiratory exchanges of *Unio* and *Anadonta* are carried on by a manganese-proteid combination analogous to the iron and copper compounds, hemoglobin and hemocyanin, and the less well-known copper and zinc combination, hemosycotypin.

The Hexone Bases in Camembert Cheese: Arthur W. Dox.

Studies on the Metabolism and Physiological Function of Phosphorus Compounds: W. H. Jordan.

On Protein Analysis: P. A. Levene, W. A. Beatty, R. D. MacLaurin and C. H. Ruiller.

On the Influence of Internal Hemorrhage on Chemical Changes in the Organism, with Particular Reference to Proteid Catabolism: F. S. Weingarten.

Two dogs were subjected to the conditions of internal hemorrhage by transferring measured volumes, about 3 per cent. of the body weight, of blood from the femoral artery to the peritoneal cavity. This was done respectively six and seven times, the dogs having first been put in nitrogenous equilibrium and fed each day with the same amount of food of known composition. Due surgical care was observed, the dogs kept under excellent conditions, and urine and feces collected each day. From the first there was a steady decline in weight, although all food given was eaten. The second dog did not regain his weight till six months after the seventh operation. At autopsy neither dog showed blood in the peritoneal cavity, there was no matting of the omentum; the only marked change was the thickening of the abdominal wall after the numerous laparotomies and one band of adhesions between the stomach and the left parietes. Collateral circulation had been prompt and effective in the legs. Daily urine volume showed marked changes, there being a decided fall on the day of hemorrhage and a very marked increase from two to four days later. The average of daily nitrogen in the urine was about the same at the end as at the beginning of each

series, having increased for the first few periods, then decreased. The average for the first three days of each period was less than that for the whole period, and more than for the last three days of the period. Similarly, the average for the last three days of a period was less than the daily average of the period. Comparison between total nitrogen ingested and excreted showed that for the first few periods in each series the amount excreted was greater than that ingested, while toward the end the reverse was true. Apparently, in the first case, the nitrogen of the hemorrhagic blood was disposed of, or, if taken into the system, allowed greater elimination from other sources. When the animals felt the effects of the hemorrhages they no longer rid themselves of this extra nitrogen, but used it in the general economy. In the one exception to this a second hemorrhage followed the first so closely that the dog was possibly unable to work up its material.

The research was carried out jointly by B. B. Crohn and the writer along lines similar to those of a previous study of the effects of external hemorrhage.

On Iodomucoid: GUSTAVE M. MEYER.

Fairly concentrated solutions of tendomucoid in 0.5 per cent. sodium carbonate were set aside at 40° with several grams of pulverized iodine. Iodine was added from time to time, so that an excess was always present during the first twelve hours. Warming was then continued until no particles of iodine were noticeable. The liquid had a deep red color. After filtration, the iodomucoid was precipitated with 0.2 per cent. HCl. The precipitate was purified by repeated washings with water, alcohol and finally with ether. A yellow powder was thus obtained, which contained 14 per cent. of iodine. The other halogens were absent. The substance otherwise possessed all of its previous protein properties. It could be redissolved in dilute alkali and precipitated without loss of iodine. Details of further study will be reported later.

A Preliminary Report on the Toxicity of Some Artificial Dyestuffs: GUSTAVE M. MEYER.

A number of commercial dyestuffs commonly used as food colorants were studied in a preliminary way as to their general behavior when administered in different amounts to dogs, with a view of selecting one or more pigments best suited for a further study of effects on metabolism. The coal-tar colors thus far studied are: curcumin *S*, tartrazine, naphthol red *S*, carmoisin *B*, naphthol yellow *S*, gold orange and ponceau 2*R*. The effective amount, or the quantity causing sufficient disturbance to warrant a discontinuance of that dose, varied from 0.83 gram per kilo body-weight for curcumin, to 7.69 grams per kilo for ponceau 2*R*. By way of comparison, it was found that the effective amount of potassium sulphate was 1.75 grams per kilo of body-weight. Ponceau 2*R* is the only one which appeared to be poisonous in the doses given. One animal succumbed after the administration of comparatively small amounts of this dyestuff (2.9 gm. per kilo of body-weight) whereas another animal was unaffected by much larger amounts (7.69 gm. per kilo). In general equally large amounts of various saline purgatives or even many substances commonly regarded as innocuous, gave effects similar to those following the use of the colorants mentioned. These dyestuffs were absorbed only to a slight extent and, therefore, their elimination through the urine was not very marked. The larger part of the ingested dyestuff passed off unaltered in the feces. This was particularly true when an excessive dose of material had been administered.

On the Excretion of Barium: Gustave M. Meyer.

On Alkaverdin, the Coloring Matter of the Purple Pitcher Plant, Sarracenia purpurea: Gustave M. Meyer and Wm. J. Gies.

The carefully selected leaves of the plant were cut and dried, and then extracted with 95 per cent. alcohol. The alcoholic extract was concentrated by evaporation, with repeated additions of water to precipitate the chlorophyl, then filtered and finally evaporated under reduced pressure at a low temperature. Heating the alcoholic solution seemed to have little effect on the pigment, but continuous heating in the presence of considerable water caused chemical alteration of the coloring matter. The residue thus obtained is a perfectly clear, red, resinous mass, soluble in water, but insoluble in absolute alcohol and in ether. It could not be induced to crystallize. The substance is free from nitrogen. The aqueous solution reduces Fehling's solution and yields glucosazone with phenylhydrazine. With benzoyl chloride a bulky benzoyl derivative was obtained. Dilute aqueous solutions are changed in color by acids and alkalies. Alkali produces a deep green, acids discharge the color. This indicator can be used for acidimetry and alkalimetry under conditions similar to those that apply to litmus. The decided change from the green to colorless condition on the addition of acid is, however, far more delicate than the change of litmus from blue to red under similar circumstances. The delicacy of this indicator is not affected by the presence of neutral salts.

On the Formation of Sugar from Amino Acids: Wm. Salant.

Experiments carried out on rabbits in which phlorhizin diabetes was induced, have shown that glycocoll administered subcutaneously or by mouth is not followed by an increased elimination of sugar.

A Biological Method for the Detection of Fluorides in Food Products: S. Amberg and A. S. Loevenhart.

Loevenhart and Peirce have recently shown that sodium fluoride even in very minute quantities greatly inhibits the hydrolysis of esters of the lower fatty acids by extracts of different animal tissues. The effect of a large number of other substances representing widely differing classes of compounds on the hydrolysis of the esters has been studied, with the result that no other substances have been found which have an inhibiting effect comparable in extent with that shown by the fluorides. Ammonium fluoride and hydrofluoric acid act quite similarly to sodium fluoride. It occurred to us that a simple and delicate test for fluorides might be founded on these observations. Clear liver extracts were prepared by the method of Loevenhart and Peirce and the activity of 1 c.c. of this was tested by diluting with 4 c.c. of water and adding 0.26 c.c. of ethyl butyrate and toluene. After acting for 16 to 24 hours at 35° to 40° the increase in acidity was determined by titration with N/20 NaOH. Simultaneously with the above test, experiments were performed in which the filtrates, neutralized if not already neutral, from various food products were used in place of the water in diluting the 1 c.c. of extract to 5 c.c. Other experiments were also simultaneously performed, using the filtrates of food products to which sodium fluoride had been added in various quantities. Working in this way, we have found that sodium fluoride when present in milk in a concentration of 1:5,000 caused an inhibition of 89.5 per cent.; 1:100,000 caused an inhibition of 87.8 per cent.; 1:1,000,000 caused an in-

hibition of 66.5 per cent. in the production of acid. Slight variations were noted with different extracts. Similarly we have found that the presence of 6 mg. of sodium fluoride in a kilo of meat can readily be detected by using the boiled aqueous extract of the meat in diluting the extract. In some cases, as with grain and beer, it is necessary to ash the product in order to concentrate the fluoride and destroy certain organic substances which when present in large quantities inhibit the action of the enzyme. A more detailed account of these experiments will soon appear.

The Elimination of Radium in Normal and Nephrectomized Animals: WM. SALANT and GUSTAVE M. MEYER.

Radium bromide was injected subcutaneously into dogs, and normal and nephrectomized rabbits. The bile, feces and intestinal contents of a dog provided with a permanent and complete gall bladder fistula were found radioactive two hours after the injection of radium. Radium bromide was also injected into a dog with a temporary biliary fistula under ether narcosis. The urine, bile, and contents of the small intestine were radioactive. Radium was not found in the contents of the large intestine. The gastric contents of these two dogs failed to show the presence of radium. The elimination of radium in rabbits takes place all along the intestinal tract, but not in the stomach. In one of the nephrectomized rabbits radium was absent in the contents of the large intestine. The presence of radium was determined by the electrometer. The materials tested were heated to destroy induced radioactivity.

A Study of the Elimination of Casein in the Bile: WM. SALANT.

Hallauer and Gürber claim to have found large quantities of casein in the bile of rabbits after injection. The elimination of native or foreign proteids in the bile has recently been made the subject of several investigations. Brauer claims to have found albumin in the bile of the dog after poisoning with amyl alcohol. Pilzecker states that large quantities of albumin are found in the bile of dogs poisoned with phosphorus or arsenic. Hallauer and Gürber injected intravenously a solution of casein into rabbits; the bile of these animals when tested with rennin showed the presence of casein soon after its administration. A critical analysis of these results convinced the writer that the subject needs further study before the conclusion may be drawn that proteins, native or foreign, are eliminated in the bile. Accordingly a series of experiments was carried out on dogs and rabbits into which milk or casein, or both, were injected intravenously and the bile was then tested for casein, in the way indicated above, with the result that none has been found. In some experiments 20 gm. of casein dissolved in sodium carbonate were injected intravenously into dogs. The bile was examined at short intervals for the next ten to twelve hours and failed to show the presence of casein.

A Study of the Conditions affecting Zymolysis: WM. N. BERG and WM. J. GIES.

Peptolysis of either fibrin, edestin or elastin is quantitatively unequal in a series of aqueous solutions of different acids under any uniform digestive conditions. Striking disparities in the velocity, quality and extent of digestion of these proteins occur in solutions of common acids, whether the acids are present in the solutions in *equal masses* (equipercentage), or in *equal numbers* of acid *molecules* (equimolecular), hydrogen *atoms* (equinormal), or hydrogen *ions* (equidissociated). Tryptolysis of fibrin or elastin is markedly unequal in equivalent solutions of bases. Among the

conditioning influences that were obviously influential in all our zymolytic experiments were the character, state and strength of the acid or base, the quality and concentration of the enzyme, the duration of the period of digestion, the temperature of the digestive mixture, and the nature of the protein. No doubt the different digestive products themselves exerted unequal influences as the proteolytic transformation proceeded. In experiments with fibrin and elastin to determine the effects of the zymolytic products of one of these proteins on the peptic digestion of the other, there was marked interference with the peptolysis of one or the other (or both) when samples of the two proteins were together in 0.2 per cent. HCl in the presence of small proportions of pepsin. The hydrogen ion is the favorable acid factor in peptolysis. The associated anions or molecules (or both) appear to interfere (as a rule) with the peptic process, and their divergent influences seem to account, in part at least, for the quantitative disparities noted in each digestive series of our experiments. It has been shown in our work, however, that *acetic acid molecules* are practically without influence, under ordinary conditions, on the peptolysis of fibrin or elastin in solutions of hydrochloric acid $M/20$—a suggestion that the purely *chemical* phases of the normal gastric digestive process are practically unaffected by vinegar in the proportions commonly ingested. The effects of acetic acid and of vinegar on the *secretory* process in the stomach will be investigated. In tryptolysis the hydroxyl anion is the favorable basic factor and the associated cations or molecules (or both) seem to exercise the deterrent influences. In general harmony with the observed digestive disparities, there were marked inequalities in the swelling effects on fibrin in every equivalent series of acid or basic solutions. Bloating influences on fibrin were due primarily to the acid or base, but were more pronounced in the presence of enzyme. Elastin did not swell perceptibly in either the acid or basic solutions employed, but did so in the latter when trypsin was present. In a given series of equivalent or basic solutions under uniform digestive conditions the degree and sequence of zymolysis of fibrin were strikingly different from those of the digestion of elastin. This fact necessitates the thorough study of the zymolysis of many proteins in samples of the same equivalent acid and basic solutions.

Putrefaction of Tendon, Collagen and Mucoid: D. E. Roelkey and Wm. J. Gies.

Unwashed tendon pieces undergo spontaneous putrefaction in distilled water, tap water and 1 per cent. sodium chloride solutions, under both aerobic and anaerobic conditions. The collaginous masses gradually undergo complete disintegration, although even after putrefaction has continued for about two months in a liquid teeming with motile bacteria, collaginous fragments containing unchanged fibers may be present. The putrefactive odors are very marked. Putrefaction at the end of the period noted, and in the liquids used, has been most advanced in the salt solution and least advanced in the tap water. Anaerobic conditions favored special velocity and extent of the changes. A study of the products of, and the conditions best suited for, the putrefaction of tendon is now yielding numerous results. Similar experiments have been begun with tendomucoid and tendocollagen.

A Further Study of the Chemistry and Pharmacology of Ibervillea Sonoræ: Julia T. Emerson and Wm. H. Welker.

Some of the largest tubers of *Ibervillea Sonoræ* were collected and an effort was made to ascertain their general chemical

composition, and to determine the nature of the substance or substances which account for the poisonous qualities attributed to them by the inhabitants of the regions in which the plant is found. Qualitative tests showed the presence of proteins, carbohydrates, fats, cholesterins, lecithins, alkaloid-like substances, inorganic salts and salts of organic acids. Quantitative determinations gave the following results: water 87.10 per cent., solids 12.90 per cent., organic matter 11.48 per cent., inorganic matter 1.42 per cent. Alcohol and ether extracts were made and the Stas-Otto method applied for the extraction of alkaloidal material. The alcohol and ether extracts showed toxic action on frogs. The material obtained by the Stas-Otto method failed to show any toxic action when administered per os or subcutaneously to a small dog. This material seemed alkaloidal in nature but could not be identified as any one of the known alkaloids. Tuber meat from normal tubers, from brown spotted tuber and the rind were fed separately to dogs in amounts up to 2 gm. per kilo of body weight without producing any apparent effects excepting marked diarrhœa. Some work now in progress is intended to determine whether any of the inorganic salts are present in sufficient quantity to produce the cathartic effect noted, or whether this action may be due to an organic acid.

The Effects of Salts of Some Rare Elements on Seedlings: ALICE A. KNOX and WM. H. WELKER.

The general method followed was that described by True and Gies.[2] Salts of the following elements were studied in this work: didymium, beryllium, erbium, lanthanum, cerium, neodymium, yttrium, cesium, and praseodymium. The comparative effects of the anions TeO_4, SeO_4 and SO_4 were also studied. The greatest molecular concentration points at which growth occurred during the first twenty hours and the least molecular concentration points where no growth occurred after the first twenty hours were carefully noted, and it was found that the increase in toxicity followed Mendeléeff's table almost mathematically, the toxicity increasing from group to group and also down each individual group with increase of molecular weight. Points of concentration where the growth reached that of the water control, where initial stimulation occurred, where maximum stimulation occurred and where the growth again returned to that of the control were noted. The results on these points were less sharply defined, as could be expected, when the high dilutions and the normal variation in the seedlings are considered. In general, however, the trend was along the lines of the periodic system.

[2] True and Gies, *Bull Torrey Bot. Club*, **30**: 390, 1903.

Studies of the Effects of Ions on Lipase: RAYMOND H. POND.

The study of lipolytic digestion has been very little in comparison with the attention that has been paid to amylolytic and proteolytic reactions. In the case of the two latter it has been found that dissociable salts inhibit digestion inversely as their decomposition tension. As the correlation mentioned has never been established completely an extension of the study to lipolytic digestion would seem profitable. A commercial product having been found to be very active in the saponification of ethyl butyrate some initial steps have been taken in the intended study. The activity of the enzyme can be satisfactorily expressed in the number of c.c. of $M/20$ KOH required to neutralize the fatty acid arising from the saponification of the neutral butyrate. A sample preparation would be 2 c.c. of a

solution of one gram of the enzyme powder in 100 c.c. of water + 2 c.c. of the toxic salt, for instance *M*/64, silver nitrate + 0.1 c.c. of the ethyl butyrate. The control would be an identical preparation except that boiling would occur before the addition of butyrate. The difference in acidity of two such preparations after a given period of digestion at a given temperature would express the amount of lipolytic activity possible in *M*/128, silver nitrate under the conditions of the test. Thus barium nitrate at a concentration of *M*/4 allows lipolytic activity, while a dilution of *M*/1024 is without any inhibitory effect. In the case of silver nitrate *M*/256 inhibits, *M*/512 allows and *M*/16384 is indifferent. The corresponding points for lead nitrate are, *M*/64, *M*/128 and *M*/8192. These figures show that the enzyme is very resistant to toxic salts. This may be due to proteid impurities. No certain stimulation has thus far been established though some figures have seemed to indicate it.

Further Observations of the Effects of the Rays of Radium on Plants: C. Stuart Gager.

Results previously reported led to the conclusion that the rays of radium and of other radioactive substances act as a stimulus to germination and growth, accelerating or retarding these processes according to the duration and distance of exposure, and the strength of the radium salt employed. Further experiments warrant a similar conclusion with respect to other plant activities, such as respiration, starch-making, geotropic response, etc. The growth of plants watered with radioactive water may be accelerated or retarded. The result varies, not only with the degree of radioactivity, but also with the species of plant employed. Growth may be accelerated in an atmosphere containing the emanation of radium. When pollen or ovules are exposed before pollination, or when exposure is made after fertilization of the egg, plants grown from the resulting seeds vary profoundly from the parent plants. The heritability of these variations has not yet been tested.

Some Chemical Notes on Specimens of American Amber: Wm. J. Gies.

The amber was discovered by Dr. Arthur Hollick several years ago, associated with fossil leaves in the cretaceous clays at Kreischerville, Staten Island. The various samples were quite different in color and transparency, but in each case closely resembled a well known variety of amber in hardness, color, specific gravity, etc. Pulverized portions of the most typical samples lost only 0.45 per cent. in weight on drying several days at 110° C. Ash content was only 0.1 per cent. Analysis indicated the following elementary composition: C, 78.5; H, 9.5; S, 0.25; O, 11.75. On destructive distillation succinic acid appeared to be formed and a considerable quantity of volatile sulphide was evolved. Long continued extraction in absolute alcohol and in anhydrous ether led to the solution of 42.6 per cent. of the powder in the former liquid, and 45.5 per cent. in the latter. The specimens appeared to consist of typical amber. Further observations on larger quantities are expected to clear up any doubt in this regard.

Effects of Acids on Tendon, with some Notes on the Preparation of Elastin, Collagen and Mucoid: Wm. J. Gies.

When sections of Achilles tendon are immersed in dilute acid, *e. g.*, 0.1 per cent. HCl, they become greatly bloated in a few hours. If the pieces are thin transverse sections to begin with, they swell to large semitransparent mulberry-masses. Such sections swell unequally in any series of different acids of equivalent concentra-

tions. The bloated masses are rigid and rebound when dropped on a hard surface. Although tendon is ordinarily very resistant to any process of maceration, the swollen masses produced by treatment with acid may be readily minced in a hashing machine. The hash thus produced forms with water a clear viscid mass, the whole of which may easily be pressed through cheese cloth, and in which the gelatinous particles are in great part indistinguishable. This viscid product bears a striking superficial resemblance to egg white, so far as consistency is concerned, but it lacks the yellowish tinge of fresh egg white. When such a viscid acid-tendon-water mixture is made alkaline, or a swollen piece of acid-tendon is dropped into dilute alkali, *e. g.*, half saturated lime water, transparency is quickly lost and there is a rapid return to the original white, opaque, *fibrous* condition of the material. This striking transformation may be brought about with great ease, even with pieces of tendon that have been immersed in acid for months. The alkaline liquid contains practically all the mucoid in the tissue. The collagen does not appear to be gelatinized or particularly dissolved. These facts furnish starting points for improved methods of preparing elastin, collagen and mucoid from ligament and tendon. This particular study was undertaken in an effort to discover the chemical state of mucoid in connective tissues. At present the results suggest a union in the tissues between collagen and glucoprotein. Further study of the phenomena alluded to and numerous physico-chemical influences on them, is in progress.

On a Glucoprotein from Tendon that is Non-precipitable by Acid: WM. J. GIES.

Tendon yields a water-soluble, acid-reacting glucoprotein product that may be extracted from that tissue with lime water, and which is non-precipitable by acid from such extracts. It is possible that this product is derived from the main mass of glucoprotein in the extract when the latter is acidified for precipitation of the traditional mucoid. Extended comparative observations of elementary composition, reactions, etc., will be made before an answer to this question will be offered.

New Studies of Mucoids and Nucleoproteins: (1) *Inorganic Salts;* (2) *Organic Salts;* (3) *Color Compounds;* (4) *Quantitative Determination:* WM. J. GIES.

Numerous *water-soluble* salts of mucoids and nucleoproteins have been made, such as salts of calcium, tetraethylammonium hydroxide, conine and azolitmine. As a rule the acid protein combines readily with the base, and the water-soluble compound may be obtained from the filtrate by precipitation with alcohol. An elaborate study of the chemistry of these compounds is now under way, including experiments on the electrical conductivity of the solutions, with the cooperation of Messrs. W. H. Welker, A. D. Emmett and J. Rosenbloom. The electrolysis of the salts and their pharmacological effects and various biological relationships are also being studied. It is impossible *completely* to precipitate either mucoid or nucleoprotein from alkaline tissue extracts by the usual acidification process, even when the greatest care is taken to prevent over-acidification. In the case of mucoid, for example, a loss of 20 per cent. or more of the material usually results with each precipitation by this method. The portion of the mucoid that is non-precipitable by acid may be precipitated from the filtrate by treatment with alcohol in moderate excess. All data heretofore obtained by various observers for the quantitative contents of mucoid in normal and abnormal tissues are incorrect —probably invariably too low. Mr. C. E. May is cooperating in a study of the quan-

titative determination of compound proteins in tissues.

Determination of Acetanilide in Headache Powders: Atherton Seidell.

The method consists in boiling the weighed sample of powder with 20 per cent. or stronger hydrochloric acid for about five minutes, by which treatment the acetanilide is converted into aniline hydrochloride. On titrating the hot or cooled solution containing a large excess of acid with standard potassium bromate solution a flocculent precipitate of aniline tribromide separates and as soon as an excess of the bromate solution is added the yellow color of the liberated bromine indicates the end of the reaction. Experiments showed that such substances as caffeine, salol, inorganic salts, etc., do not interfere with the accuracy of the titration, but that the presence of phenacetine or of antipyrine renders the method inapplicable.

Most of the papers presented at the meetings will be published later in the different chemical journals.

The meetings were well attended, and owed much of their success to the trustees and faculty of Columbia University. A unanimous vote of thanks was tendered to them and the Chemists' Club, to the College of the City of New York and to the different industrial establishments which the visiting chemists had been invited to inspect.

This report has been transmitted through Professor Charles L. Parsons, Secretary of Section C.

C. E. Waters,
Press Secretary.

SCIENTIFIC BOOKS

Inheritance in Poultry. By C. B. Davenport, Director of Station for Experimental Evolution. Publications of the Carnegie Institution of Washington. No. 52, 1906.

The important and extensive series of experiments with poultry, carried out by Bateson and Saunders and Hurst in England have shown the general application of Mendelian principles to inheritance in this group. These authors have demonstrated the relation of dominance and recession of many of the characters of poultry, showing, for example, the dominance of rose comb, white plumage, extra toe, feathered shanks, white and blue shanks, crested head, brown egg color, and broodiness; and the recession of leaf comb, single comb, black plumage, buff plumage, normal foot, clear shanks, uncrested head, white egg color, and non-broodiness. The same investigators have likewise shown that Mendelian splitting occurs in the second generation, and have referred the results to Mendel's hypothesis of segregation in the gametes of the first generation of hybrids. They have also drawn attention to the fact that the dominance of characters in poultry is not always complete in the first generation. Hurst estimated, in fact, that incomplete dominance is twice as numerous as complete dominance. It was also observed that in the second generation there is often a mixing of the characters, so that it is difficult or impossible to distinguish the pure forms from the 'dominant-recessives.' In other words, there may be almost a continuous series in this generation. Such results are difficult to account for on the basis of 'pure' gametes, although a tendency towards segregation may be distinctly recognized. The case most difficult to explain in this connection is the inheritance of extra toes. Castle's recent experiments with polydactylism in guinea pigs have shown in fact that prepotency, rather than Mendelism, is a more important factor in this kind of inheritance. It looks as though certain individuals may transmit a given peculiarity differently from other individuals; and while the 'lump-sum' may often give an approximation to Mendelian expectation, the really important fact is not the chance result, but the prepotency of certain individuals in regard to the transmission of characters.

Professor Davenport's work covers in part the same ground as that of Bateson and his co-workers; in part, however, he has studied different characters and races, and has been